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Instances of extravagant stories of this kind are not uncommon in Brazil. The case of the *salamandro* already referred to is a good example. Another is that of a plant, a species of smilax, which is said to grow from the dead body of a Cicada. Belief in this story is so general that through some parts of the country a certain plant is popularly known as the *japecanga da cigarra*, or cicada smilax. Those who claimed to have actually seen this phenomenon represented that the plants seen by them were all quite young. Doubtless they were cases of larvæ killed by parasitic fungoid growth.¹

Such stories come, of course, from imperfect observation, and have an air of truth about them derived from their association with known objects or facts.

NOTE.—We are unable to find any reference in entomological works as to the poisonous nature of this insect, which is undoubtedly perfectly harmless. It is, however, disputed whether the insect is luminous or not. See Westwood's Introduction to the Modern Classification of Insects, II, 428, where after referring to his figure of the head of *Fulgora lanternaria*, he says it "is the part of the body asserted by various writers to emit a strong light by night, analogous to that of the fireflies." The account of the luminosity of this insect originated with Madam Merian, but it was denied by Olivier, in which opinion Hoffmansegg, the Prince Von Nieuwied and Lacordaire concurred. "M. Wesmaël has recently reasserted the luminous property of the South American species on the authority of a friend who had witnessed it alive. And W. Baird, Esq., has informed me of the existence of a Chinese edict against young ladies keeping lantern flies." In our Guide to the study of Insects (p. 533) is the following statement regarding the East African lantern fly: "Mr. Caleb Cooke, of Salem, who resided several years in Zanzibar, Africa, informs me that the lantern fly is said by the natives to be luminous. They state that the long snout lights up in the night, and in describing it say "its head is like a lamp" (keetchua kana-tah).—A. S. Packard.

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AGE OF FOREST TREES.

BY JNO. T. CAMPBELL.

THE age of trees that have an exogenous growth is correctly indicated by the concentric rings of growth shown in their cross-section. These rings also, when correctly interpreted give a true history of the tree from its infancy to maturity and old age; showing correctly the dates of prosperity and adversity in the career of the tree.

¹ Comte Charles d'Ursel, in his *Sud Amérique*, figures and describes, after a fashion, "l'insecte qui devient plante," found in Brazil. Speaking of the plant, he says that "au printemps elle se couvre de fleurs bleues," p. 107.

One ring is formed each year between the bark and the previously-formed wood. If there is a large healthy top of branches, these concentric rings will be relatively large, especially so if the tree is not overshadowed by older and larger ones. During the past fifteen years there have been thousands of white oak trees sawed down in this country (Western Indiana) for staves, and I have taken the time and trouble to count the ages of several hundred of them; also the ages of other forest trees; but my observations of the oaks have exceeded those of all other kinds. I was led into this investigation by reading an article in a newspaper purporting to be copied from some scientific magazine, the name of which I have forgotten, which article claimed, not only confidently but positively, that the large rings of growth indicated past wet years in Kansas, or years favorable to vegetation, and that the small rings indicated past dry years, or years unfavorable to vegetable growth. The article stated that the count from the outside ring inwardly coincided with the past seasons historically as far back as the whites or Indians had any tradition of the seasons. The article further stated that some English scientific journal had published an article by some traveler up the Nile, in Egypt, who had made the same discovery there. He had counted the rings on the oak stumps there from the outside inwardly, comparing them with the years counted backwards, and had made the startling discovery that the seven years of plenty followed by the seven years of famine during Joseph's rule in Egypt, were actually and accurately registered on the stumps. Sometimes an absurdity is so plain that nobody sees it at all. This is one of that sort. It did not then occur to me that a tree old enough to keep books in Joseph's time would, if living now, be about twenty-five feet in diameter, if it grew like an average Hoosier oak. But the story had a charm for the credulous, and it led me to estimate the age of trees here, and to compare the large and small rings with the years of plenty and the years of famine. To my surprise, and considerable disappointment, there was no coincidence whatever between them. I found stumps of trees of the same species, the same size (and presumably the same age) standing within twenty feet of each other, on the same kind of soil, cut down the same year, and, so far as I could judge, subject to the same conditions throughout, one showing a large ring where its neighbor would show only an average one, and in some few

cases they showed the opposite—one large and the other small. I examined enough to prove that whatever they might show in Kansas or in Egypt, they showed nothing of the kind in Western Indiana.

I have not been, so far, able to account for the spasmodic production of single rings of large or small growth, interspersed here and there among those of the average size. But when a succession of large, and especially small, rings prevail, say from ten to seventy-five or more, I can see a possible cause producing them, and have strong circumstantial evidence that such is the very probable cause of the large or small rings. Trees are like men in some respects. More are born than can live; more live than thrive; more thrive than can be masters.

“The young cannot hold sway
Till the old are dead and out of the way.”

The tree that falls behind its fellows in the race of life will very likely fall behind the more active of the next generation also. Many are crowded and smothered out in infancy by their more vigorous brother infants. Nature is not generous or charitable. She knows but one law of growth: “To him that hath, shall be given; to him that hath not, the little he hath shall be taken away.” When a tree gets but little the start of its immediate fellows, all the nourishment of nature seems to be offered to it, instead of its more needy neighbors. And to the weakest, nature gives next to no sympathy at all. I have seen two trees of the same species, the same age to a year, standing side by side, the one three times the diameter of the other and more than twelve times the solid contents counting increased length. Both were equally healthy, but the smaller had long ago been beaten for the nomination to leadership in convention, and had dropped back among and remained one of the mere constituents. The first rays of the morning’s sun fell on the larger tree. The smaller one had to wait till eleven o’clock for sunshine, and was cut off at 2 P. M., while the larger one received it till sundown. If there was only a small shower the larger one got it. The smaller one got no rain except from heavy showers which leaked through the top of the larger one. In such a case the larger tree would have large concentric rings, while the smaller one would have them so fine they could be counted only under a magnifying glass. I have often seen just such cases.

I have been a civil engineer and land surveyor since 1867, and as such have had occasion to examine many trees referred to in the field notes. The United States surveyed the land into sections of one mile square each, and drove stakes at the section corners, and also at the quarter section corners equidistant between the section corners. They also blazed two trees near these corners about one and a half feet above the ground, cutting a small notch in the blaze, and gave in the field notes the size and species of the trees marked, and their courses and distances from the corners.

About fifty years had elapsed between the date of the survey and my day as a surveyor. Many of these trees could be identified at sight by the scar where the blaze was made. In other cases the tree would be so much larger than the size given in the field notes that the blaze would be obliterated by the spread of the bark, and the doubt would have to be settled by chopping into it at the place indicated by the notes. If we found the blaze and notch, we next counted the rings from the outside into the blaze. If the count of rings tallied with the date of the survey—all well. Mark a new tree and record it in what we call the subsequent field notes.

In the year 1868 or 1869 I was making a survey in the eastern part of the county. At a certain corner wanted, the field notes called for an ash three inches in diameter. The only ash near and answering to the locality, was about eighteen inches in diameter. Nobody expected to find so large a tree in the fifty years that had elapsed since it was marked. But on chopping into it we found the blaze and notch near the heart, revealing the unmistakable fact that it was the real "witness tree," and that it had been marked by a left-handed chopper with a dull axe. A look at the ground and timber about the corner showed the further fact that just before the original (United States) survey was made, a tornado had passed over that place and blown down all the adult trees, as all the present ones were young and thrifty, and the graves of the fallen trees were as plain as any mark could be. A tree-grave is easily known; as the tree falls the roots hold a considerable quantity of earth in their grasp, which leaves a large hole in the ground under where the tree stood. In time the body and roots will rot, leaving the dirt piled up on the side of the hole the tree fell on, and it looks as if a grave had been dug with

the dirt all cast out on one side, and the corpse had got away and the grave remained unfilled. This tree had increased six times its diameter, and more than thirty-six (and counting the increased length nearly seventy-two) times its solid contents since the government surveyors had marked it.

The next year I made a survey in the rough hills of Sugar creek in the north-east part of the county, and in identifying a land corner I had occasion to examine another ash described in the field notes as three inches in diameter also. It stood on the point of a sandstone ridge, between three large white oaks, which formed a triangle around it, and were about fifteen feet apart. This ash, the same species as the one before described, had not grown to exceed one-half inch in the increase of its diameter in the fifty or fifty-one years since it had been marked. This would allow only one-fourth of an inch on each side; yet I counted under a magnifier, in this small space, the required number of rings of growth. They were thinner than common book paper, as they were at the rate of two hundred to the inch. This tree had increased only thirty-six per cent in fifty years, while the former had increased about seven thousand per cent in the same time. Why this difference in the size of these two ash trees? The reasons are plain. The former had a good soil on level ground, and the tornado had destroyed all the adult trees that would rob it of sunshine, rain and soil nourishment. The latter stood in dissolved sandstone for soil, on the top of a narrow ridge between three large oaks, which robbed it of sunlight and rain, and nearly all the soil nourishment. It had but five or six small branches for a top, and but few leaves to the branch. Under such conditions it did well to even exist. But to do this it was obliged to add a ring each year.

Eleven years ago I examined the stumps of two white oaks and the grave of a third, which told this singular story by circumstantial evidence so strong that it could not be doubted. In the year 1502 an acorn fell about one and a half miles from where I am now writing (Rockville, Indiana), and by favorable chance sprouted and grew into an oak. In 1594 another acorn sprouted about twenty feet distant from it. It may have grown on the tree before mentioned, as it was then ninety-two years old. In 1731 a tornado from the north-west blew down a still older oak, which in its fall struck against and greatly damaged the top of the one

born in 1502. There is to-day the well-marked grave of the fallen giant, the dirt piled upon the south-east side of the hole, and a long depression in the ground where the trunk fell and rotted till not a vestige of its wood can be seen to-day (though some traces of the bark of the roots can). This depression points to the stump of the damaged oak. The two younger had been freshly cut down when I examined them. Their stumps were about four feet across, and there was not over an inch difference between their diameters, though ninety-two years difference in their ages. The younger had a large, healthy top, no broken or dead limbs, and it had put on rings of growth from the beginning of more than average size. The older one had been injured in its branches by the fall of the still older one before mentioned (in 1731) and for fifty-seven years had put on very small rings of growth (about twenty-five to thirty years to the inch instead of twelve to fifteen as it should), when a new set of branches developed to take the place of the damaged ones, and the rings began to increase in size and gradually attained to the average. I examined their tops, which coincided with what has gone before. There were the peculiar knots in the top of the older one where dead limbs had rotted off and were healed over. (Any expert timberman will readily recognize them.) During this delay the younger oak caught up with the older one in size. The size of a tree is a very uncertain indication of its age.

In all the cases of the hundreds I have examined of the oaks (the oldest trees of the forest I think), I never saw but one that was here when Columbus discovered America. That one was by far the largest I ever saw, and was over six hundred years old, about twice the age of the other largest ones. I could not get its exact age as it was so decayed near the heart I could not distinguish the rings. It was between six and seven feet in diameter, and forked about sixty feet up, and each fork was as large as the other largest trees. It was not sound enough to make good lumber, being what in this region is called "doughty," a state between soundness and rottenness. It had been down a year before I examined it (being out of the county when it was cut), so that it was very difficult to examine it. I have mislaid my memorandum of it, but it would be about as follows: At the age of about two hundred years it had some ill-fortune which caused it to form about one hundred small rings. It then regained its

health and formed normal rings for about one hundred and forty years, when another mishap caused small rings till within the last fifty years, when it was putting on fair growths again. This tree was about one and a half miles south-east of Rockville, Indiana, and was noted among hunters and woodmen. It was a disagreeable showery day when I examined it, and for that reason I did not examine its top to see if dead and lost and healed-over limbs coincided with the small rings, but I have often done so in other cases, and found them to coincide.

Last May (1884) I examined a sycamore and water elm in the Wabash river bottom, the former six feet in diameter and the latter five, each one hundred and eighty years old. They stood about one hundred and fifty feet apart. They were standing on the upper end of a newly made bottom (I mean new as compared with the higher and older bottoms a little more inland from the river, say two hundred years old). This was the largest sycamore I ever saw that was sound to the heart. I have seen hollow ones nearly eight feet in diameter. This tree seems never to have met with any mishap till the log man came along, as the rings of growth were all unusually large.

These trees very probably sprouted twelve to fifteen feet below the present surface of the bottom. They generally begin life on the lower end of river sandbars, and as sedimentation builds up the surface, they put out new surface roots at every two to three feet of elevation. Such trees with their several sets of surface roots, are often seen in drift piles, and also still standing on the verge of a steep river bank where one side is exposed by the erosion of the river. Their roots are often hollow like their trunks, the hollow (and root too) decreasing in diameter downward till it terminates in a point, like a cone standing on its point. In the south-west corner of this county is a hollow cottonwood stump on what is now a high bottom of the Wabash, in which the hollow extends downward twelve feet. Mr. Joseph J. Daniels, an intelligent, observing man, on whose land it stands, told me so. Such silting up over the surface roots would kill most of the upland trees, or those that grow from the seed on the high bottoms.